

CLAIMS

WHAT IS CLAIMED IS:

1. A powered air cleaning system comprising:  
5 a flow path extending through the system from an inlet to an outlet;  
a motor-driven fan located along the flow path to draw particulate debris laden air into the inlet and rotate it about an axis to form a rotating flow that stratifies the debris laden air with the heaviest particles in the outermost orbits of the rotating flow;  
an ejector port for ejecting particulate debris laden air from the stratified  
10 rotating flow in the system; and  
an air filter located within the rotating flow and across the flow path upstream of the outlet for filtering air from the innermost orbits of the stratified rotating flow;  
wherein the ejector port is located radially outward of the outermost orbits of the rotating flow.  
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2. The air cleaning system according to claim 1, wherein the filter is elongated in the direction of the axis about which the debris laden air is rotated.
3. The air cleaning system according to claim 2, wherein the ejector port  
20 is elongated in a direction along the length of the elongated filter.
4. The air cleaning system according to claim 2, wherein an outer peripheral surface of the elongated filter is cylindrical.

5. The air cleaning system according to claim 1, further comprising a compression assembly for compressing the volume of the rotating flow of debris laden air to increase the air velocity and centrifugal force acting on the airborne particles.

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6. The air cleaning system according to claim 5, wherein the compression assembly provides support for the motor-driven fan.

7. The air cleaning system according to claim 5, wherein the compression  
10 assembly includes a plurality of stationary vanes in the flow path.

8. The air cleaning system according to claim 5, further comprising a separator-ejector chamber in the flow path downstream of the compression assembly, the outermost orbits of the rotating flow riding on an outer wall of the  
15 separator-ejector chamber, the ejector port being located in the outer wall of the separator ejector chamber.

9. The air cleaning system according to claim 8, wherein said filter is located centrally within said separator-ejector chamber.

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10. The air cleaning system according to claim 1, further comprising a generally cylindrical housing, said inlet and said outlet being arranged at respective ends of said housing and said flow path extending through housing.

11. The air cleaning system according to claim 10, wherein said ejector port is arranged in a generally cylindrical outer wall of the housing radially outward from the air filter.

5 12. The air cleaning system according to claim 11, wherein said filter extends along a central longitudinal axis of the generally cylindrical housing from the outlet end thereof and the ejector port is in the form of an ejector slot which extends the length of the air filter.

10 13. The air cleaning system according to claim 12, further comprising a bracket for supporting within the housing an end of the filter remote from the outlet end of the housing.

15 14. The air cleaning system according to claim 1, further comprising a debris strake connected to the air filter for channeling debris away from the filter to the outermost orbits of the rotating flow.

15. A powered air cleaning system for use with a device having a variable air flow demand, the system comprising:

20 a flow path extending through the system from an inlet to an outlet for supplying air to the device;

a motor-driven fan located along the flow path to draw particulate debris laden air into the inlet and rotate it about an axis to form a rotating flow that stratifies the debris laden air with the heaviest particles in the outermost orbits of the rotating flow;

an ejector port for ejecting particulate debris laden air from the stratified rotating flow in the system;

an air filter located within the rotating flow and across the flow path upstream of the outlet for filtering air from the innermost orbits of the stratified rotating flow;

5        a debris strake connected to the air filter for channeling debris away from the filter to the outermost orbits of the rotating flow;

wherein the motor-driven fan is operable to maintain positive air flow pressure to eject debris laden air from the stratified rotating flow in the system at all rates of air flow demanded by the device.

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16.    The air cleaning system according to claim 15, wherein the device with a variable air flow demand is an internal combustion engine which exerts a variable vacuum on the outlet of the system by way of the air intake of the engine.

15        17.    An air cleaning method comprising:

drawing particulate debris laden air into an air cleaning system with a motor-driven fan located in the system;

forming a rotating flow of the debris laden air in the system to stratify the flow with the heaviest particles in the outermost orbits of the rotating flow;

20        flowing air from the innermost orbits of the rotating flow through a filter enroute to an outlet of the system, the filter being located within the rotating flow which provides a self cleaning action on the filter;

channeling debris away from the filter to the outermost orbits of the rotating flow with a debris strake connected to the filter; and

ejecting particulate debris laden air from the stratified rotating flow in the system.

18. The method according to claim 17, wherein said ejecting is performed  
5 without disrupting the stratified rotating flow in the system.

19. The method according to claim 17, wherein said ejecting includes  
flowing stratified rotating flow through an ejector port located radially outward of the  
outermost orbits of the rotating flow opposite the filter.

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20. The method according to claim 17, for use in supplying air to a device  
with a variable air flow demand which applies a variable vacuum to the outlet of the  
air cleaning system, the method further including operating the motor-driven fan to  
maintain positive air flow pressure to eject particulate debris laden air from the  
15 rotating flow in the system at all rates of air flow demand by the device and to allow  
buildup of debris on the filter to be removed at least during low rates of air flow  
demand.

21. The method according to claim 20, wherein the device is an internal  
20 combustion engine which is supplied air from the outlet of the system.

22. An air cleaning method comprising:  
drawing particulate debris laden air into an air cleaning system with a motor-  
driven fan located in the system;

forming a rotating flow of the debris laden air in the system at a positive air flow pressure to stratify the flow with the heaviest particles in the outermost orbits of the rotating flow;

5       ejecting particulate debris laden air from the outermost orbits of the stratified, positively pressured rotating flow in the system through an ejector port located radially outward of the outermost orbits of the rotating flow; and

      withdrawing air from the innermost orbits of the rotating flow in the system through an outlet of the system by applying a vacuum to the outlet.

10       23.    The method according to claim 22, including operating the motor-driven fan to maintain the positive air flow pressure to eject particulate debris laden air from the outermost orbits of the stratified rotating flow in the system at all rates of withdrawal of air through the outlet of the system.

15       24.    The method according to claim 22, wherein the ejector port is in the form of a slot in a housing containing the rotating flow, the slot extending in a direction transverse to the direction of rotation of the rotating flow.